CLAIMS

We claim:

1. A photovoltaic device adapted for performing biological operations comprising:

a) a photovoltaic semiconductor chip, which comprises a photovoltaic semiconductor substrate, having a first side and a second side opposite the first side, and at least one microlocation formed by at least one metallic film disposed on the first side of the substrate to receive a solution comprising a biological sample;

b) a light source for providing photovoltaic energy to the microlocation and to subject the solution to an electrophoretic force.

2. The photovoltaic device of claim 1 wherein the microlocations on the photovoltaic semiconductor chip are arranged in an array and are isolated from each other by a dielectric material.

3. The photovoltaic device of claim 2 wherein the dielectric material is SiO_2.

4. The photovoltaic device of claim 1 wherein the second side of the substrate is coated with a metal film to effect stringency on the solution at the microlocation.

5. The photovoltaic device of claim 4 wherein the metal film is selected from the group consisting of gold aluminum, titanium, nickel, chrome, platinum, and alloys thereof.

6. The photovoltaic device of claim 1 further comprising a plate transparent to light and disposed on the microlocation to form a chamber.

7. The photovoltaic device of claim 6 wherein the plate is glass, quartz or sapphire.

8. The photovoltaic device of claim 6 wherein the plate is coated on the surface facing the microlocation with a transparent conductive thin film.

9. The photovoltaic device of claim 6 wherein the transparent conductive thin film is selected from the group consisting of indium tin oxide, indium oxide, tin oxide cadmium oxide, cadmium stannate and zinc stannate.

10. The photovoltaic devices of claim 1 wherein metallic layers are deposited on two opposite sides of the microlocation.

11. The photovoltaic device of claim 10 wherein the metallic layers comprises material selected from the group consisting of gold, aluminum, titanium, nickel, chrome, platinum, and alloys thereof.

12. The photovoltaic device of claim 1 further comprising a permeation layer disposed adjacent to the metallic film.

13. The photovoltaic device of claim 1 further comprising at least one lens between the light source and the microlocation to focus the light from the light source onto at least one microlocation.

14. The photovoltaic device of claim 13 where the light is focused on the side of the microlocation that receives the solution comprising the biological sample.

15. The photovoltaic device of claim 13 where the light is focused on the side of the microlocation opposite of the side of the microlocation that receives the solution comprising the biological sample.

16. A method of facilitating a biological operation comprising the steps of:

immobilizing a first biological species on the surface of a microlocation of a photovoltaic device of claim 1;

placing a solution comprising a second charged biological species into the microlocation; and

exposing the microlocation to light to create an electrophoretic force to move the charged second biological species toward the immobilized first biological species.

17. The method of claim 16, wherein the biological operation is selected from the group consisting of nucleic acid hybridization and antibody/antigen reaction.

18. The method of claim 16 further including the step of:

applying a voltage to the photovoltaic device to subject the solution to a second electrophoretic force to effect stringency on the solution at the microlocation.